

PLAN

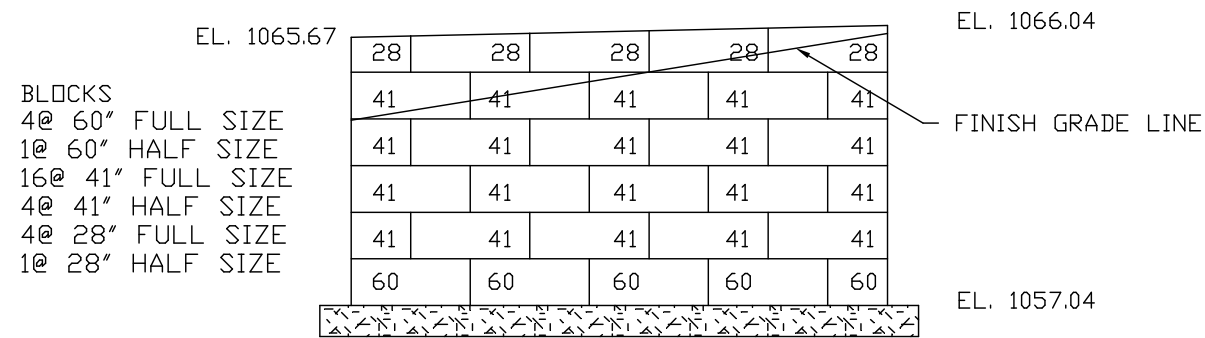
PLAN

REV. NO.	DATE:
1	??/??/??

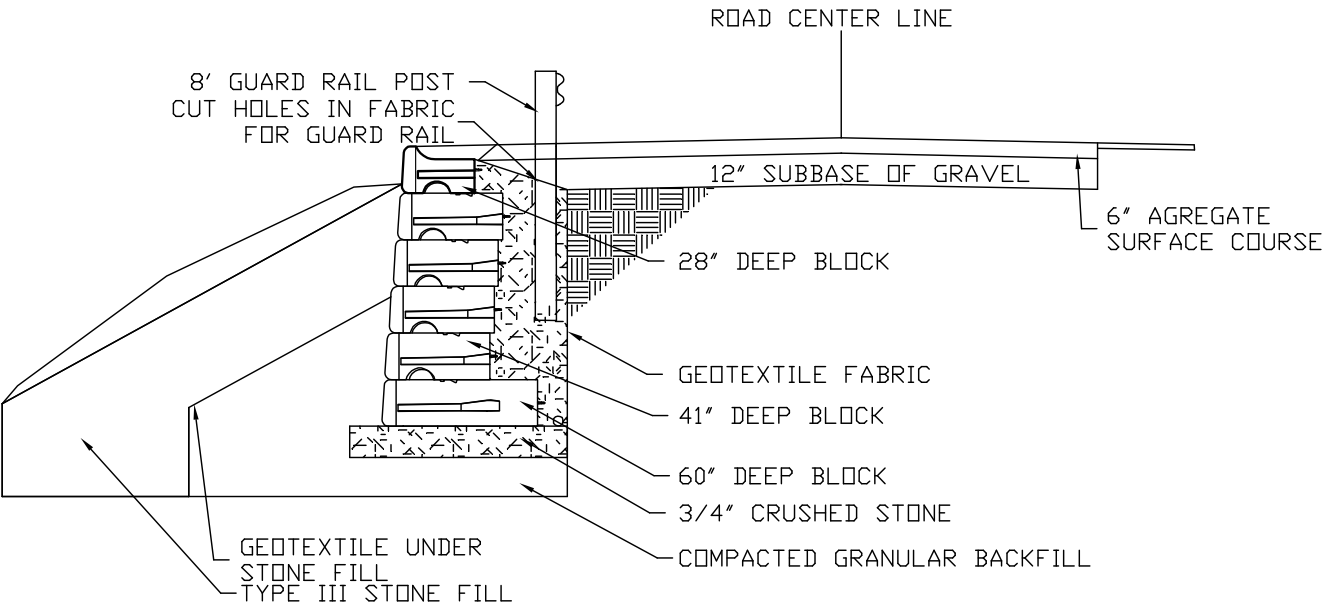


RENAUD BROS. INC.
 289 FT. BRIDGMAN RD. VERNON VT., 05554
 PH. (802) 251-7585 FAX (802) 251-7508

SHEET NAME:		
RETAINING WALL PLAN		
PROJECT NAME:		SHEET NO. 1 OF 8
GUILFORD BRO		
PROJECT NO:		
1442 (36)		
DRAWN BY:	CHK'D BY:	DATE:
CDE		07/21/2014



ELEVATION



SECTION
STA 102+31

NOTES:
1. ALL BLOCKS ARE REDI ROCK LIME STONE FINISHED BLOCKS.

REV. NO.		DATE:		RENAUD BROS. INC. <small>285 FT. BRIDGMAN RD. VERNON VT., 05554 PH. (802) 251-7585 FAX (802) 251-7508</small>	SHEET NAME: RETAINING WALL ELEVATION AND SECTION	
1 ?		/??/??			PROJECT NAME: GUILFORD BRO	
					PROJECT NO: 1442 (36)	
					SHEET NO. 2 OF 8	
DRAWN BY: CDE		CHK'D BY:		DATE: 07/21/2014		

Analysis of Redi Rock wall

Input data

Project

Task : GUILFORD VERMONT
 Descript. : RETAINING WALL
 Author : RON BELL
 Customer : RENAUD BROTHERS CONSTRCUTION
 Date : 7/11/2014

Settings

ASD - Skewed Back - NCMA 3rd Edition Table 5-2 Factors

Wall analysis

Active earth pressure calculation : Coulomb
 Passive earth pressure calculation : Caquot-Kerisel
 Earthquake analysis : Mononobe-Okabe
 Shape of earth wedge : Calculate as skew
 Reduction coeff. of contact first block - base : 0.70
 Verification methodology : Safety factors (ASD)
 Reduce parameters of contact base - soil

Safety factors			
Permanent design situation			
Safety factor for overturning :	$SF_o =$	1.50	[-]
Safety factor for sliding resistance :	$SF_s =$	1.50	[-]
Safety factor for bearing capacity :	$SF_b =$	2.00	[-]

Reduction coefficients			
Permanent design situation			
Reduction coeff. of contact base - soil :	$\mu =$	1.00	[-]

Blocks

No.	Description	Height h [in]	Width w [in]	Unit weight γ [pcf]
1	Block 28	18.00	27.75	130.00
2	Block 41	18.00	40.50	130.00
3	Block 60	18.00	60.00	130.00
4	Top block 24	18.00	24.00	130.00
5	Planter 41	18.00	40.50	112.00

No.	Description	Shear cap. F [lbf/ft]	Max. shear cap. F _{max} [lbf/ft]	Friction f [°]	Cohesion c [psf]
1	Block 28	1700.00	9000.00	75.00	0.0
2	Block 41	1700.00	9000.00	75.00	0.0
3	Block 60	1700.00	9000.00	75.00	0.0
4	Top block 24	1700.00	9000.00	75.00	0.0
5	Planter 41	1700.00	9000.00	75.00	0.0

Setbacks

No.	Setback s [in]
1	0.375

No.	Setback s [in]
2	1.625
3	9.375
4	16.625




Geometry

No. group	Description	Count	Setback s [in]
1	Block 60	1	1.62
2	Block 41	4	1.62
3	Block 28	1	1.62

Base**Geometry**Upper setback $a_1 = 0.50$ ftLower setback $a_2 = 0.50$ ftHeight $h = 1.00$ ftWidth $b = 6.00$ ft**Material**

Soil creating foundation - CRUSHED STONE

Soil bearing capacity $R_d = 6000.0$ psf**Basic soil parameters**

Number	Name	Pattern	φ_{ef} [°]	c_{ef} [psf]	γ [pcf]	γ_{su} [pcf]	δ [°]
1	Well graded gravel (GW), dense		41.50	0.0	133.00	70.50	32.00
2	Poorly graded gravel (GP), dense		38.50	0.0	127.00	70.50	32.00
3	CRUSHED STONE		40.00	0.0	130.00	77.50	26.00

All soils are considered as cohesionless for at rest pressure analysis.

Soil parameters**Well graded gravel (GW), dense**Unit weight : $\gamma = 133.0$ pcf

Stress-state : effective

Angle of internal friction : $\varphi_{ef} = 41.50^\circ$ Cohesion of soil : $c_{ef} = 0.0$ psfAngle of friction struc.-soil : $\delta = 32.00^\circ$ Saturated unit weight : $\gamma_{sat} = 133.0$ pcf**Poorly graded gravel (GP), dense**Unit weight : $\gamma = 127.0$ pcf

Stress-state : effective

Angle of internal friction : $\varphi_{ef} = 38.50^\circ$ Cohesion of soil : $c_{ef} = 0.0$ psfAngle of friction struc.-soil : $\delta = 32.00^\circ$

Saturated unit weight : $\gamma_{\text{sat}} = 133.0$ pcf

CRUSHED STONE

Unit weight : $\gamma = 130.0$ pcf

Stress-state : effective



Angle of internal friction : $\phi_{\text{ef}} = 40.00^\circ$

Cohesion of soil : $c_{\text{ef}} = 0.0$ psf

Angle of friction struc.-soil : $\delta = 26.00^\circ$

Saturated unit weight : $\gamma_{\text{sat}} = 140.0$ pcf

Geological profile and assigned soils

Number	Layer [ft]	Assigned soil	Pattern
1	12.00	Well graded gravel (GW), dense	
2	-	Poorly graded gravel (GP), dense	

Terrain profile

Terrain behind construction has the slope 1: 5.00 (slope angle is 11.31°).

Water influence

GWT behind the structure lies at a depth of 8.00 ft

Uplift in foot. bottom due to different pressures is not considered.

Input surface surcharges

Number	Surcharge new	change	Action	Mag.1 [lbf/ft ²]	Mag.2 [lbf/ft ²]	Ord.x x [ft]	Length l [ft]	Depth z [ft]
1	YES		permanent	250.0				on terrain

Number	Name
1	VEHICLE SURCHARGE

Resistance on front face of the structure

Resistance on front face of the structure: at rest

Soil on front face of the structure - Poorly graded gravel (GP), dense

Soil thickness in front of structure $h = 1.50$ ft

Terrain in front of structure is flat.

Settings of the stage of construction

Design situation : permanent

Verification No. 1

Forces acting on construction

Name	F_{hor} [lbf/ft]	App.Pt. Z [ft]	F_{vert} [lbf/ft]	App.Pt. X [ft]	Design coefficient
Weight - wall	0.0	-4.18	4739.8	2.69	1.000
FF resistance	-53.9	-0.50	0.1	0.25	1.000
Weight - earth wedge	0.0	-1.45	23.6	5.66	1.000
Weight - earth wedge	0.0	-3.59	322.5	4.58	1.000

Name	F _{hor} [lb/ft]	App.Pt. Z [ft]	F _{vert} [lb/ft]	App.Pt. X [ft]	Design coefficient
Weight - earth wedge	0.0	-9.58	293.5	3.20	1.000
Active pressure	1523.9	-3.46	2343.8	5.17	1.000
Water pressure	125.0	-0.67	0.0	3.67	1.000
Uplift pressure	0.0	-10.00	0.0	1.59	1.000
VEHICLE SURCHARGE	554.1	-5.16	849.2	4.81	1.000

Verification of complete wall

Check for overturning stability

Resisting moment $M_{res} = 31490.4$ lbfft/ft

Overturning moment $M_{ovr} = 8195.7$ lbfft/ft

Safety factor = 3.84 > 1.50

Wall for overturning is SATISFACTORY

Check for slip

Resisting horizontal force $H_{res} = 7584.24$ lb/ft

Active horizontal force $H_{act} = 2149.07$ lb/ft

Safety factor = 3.53 > 1.50

Wall for slip is SATISFACTORY

Forces acting at the centre of footing bottom

Overall moment $M = 2422.7$ lbfft/ft

Normal force $N = 8572.43$ lb/ft

Shear force $Q = 2149.07$ lb/ft

Overall check - WALL is SATISFACTORY

Bearing capacity of foundation soil

Forces acting at the centre of the footing bottom

Number	Moment [lbfft/ft]	Norm. force [lb/ft]	Shear Force [lb/ft]	Eccentricity [ft]	Stress [psf]
1	2422.7	8572.43	2149.07	0.28	1577.3

Bearing capacity of foundation soil check

Eccentricity verification

Max. eccentricity of normal force $e = 3.39$ in

Maximum allowable eccentricity $e_{alw} = 23.76$ in

Eccentricity of the normal force is SATISFACTORY

Footing bottom bearing capacity verification

Max. stress at footing bottom $\sigma = 1577.3$ psf

Bearing capacity of foundation soil $R_d = 5000.0$ psf

Safety factor = 3.17 > 2.00

Bearing capacity of foundation soil is SATISFACTORY

Overall verification - bearing capacity of found. soil is SATISFACTORY

Dimensioning No. 1**Forces acting on construction**

Name	F _{hor} [lb/ft]	App.Pt. Z [ft]	F _{vert} [lb/ft]	App.Pt. X [ft]	Design coefficient
Weight - wall	0.0	-3.91	3959.8	2.13	1.000
FF resistance	-6.0	-0.17	0.0	0.00	1.000
Weight - earth wedge	0.0	-2.59	322.5	4.08	1.000
Weight - earth wedge	0.0	-8.58	293.5	2.70	1.000
Active pressure	1214.6	-3.14	1684.6	4.40	1.000
Water pressure	31.2	-0.33	0.0	3.17	1.000
Uplift pressure	0.0	-9.00	0.0	1.09	1.000
VEHICLE SURCHARGE	489.7	-4.73	707.0	4.10	1.000

Verification of block No.1**Check for overturning stability**Resisting moment $M_{res} = 20830.6$ lbfft/ftOverturning moment $M_{ovr} = 6137.4$ lbfft/ft

Safety factor = 3.39 > 1.50

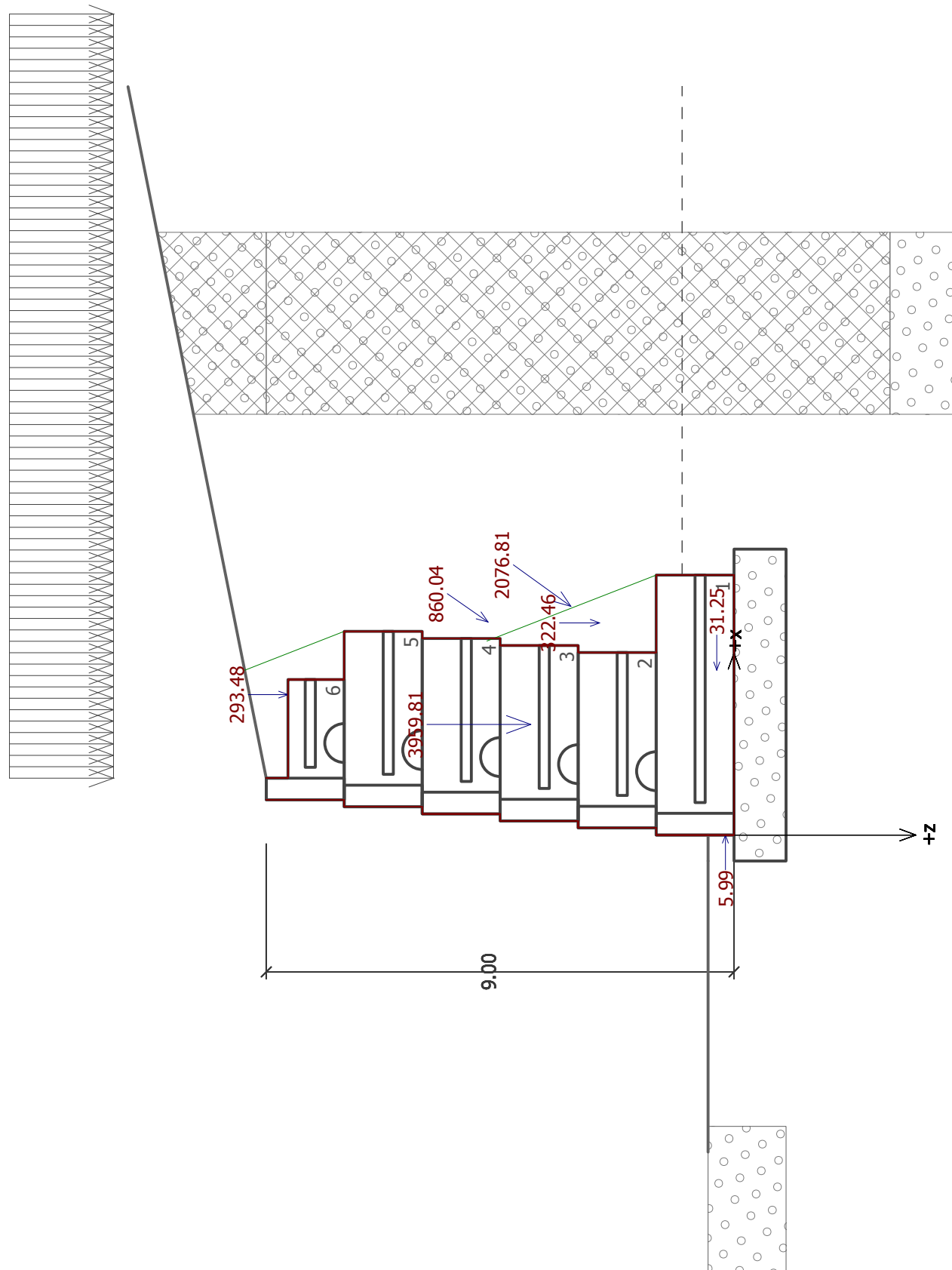
Joint for overturning stability is SATISFACTORY**Check for slip**Resisting horizontal force $H_{res} = 4092.43$ lb/ftActive horizontal force $H_{act} = 1729.54$ lb/ft

Safety factor = 2.37 > 1.50

Joint for verification is SATISFACTORY**Verification of bearing capacity of soil:**Maximum stress $\sigma = 1651.9$ psfBearing capacity of footing material $R_d = 6000.0$ psf

Safety factor = 3.63 > 2.00

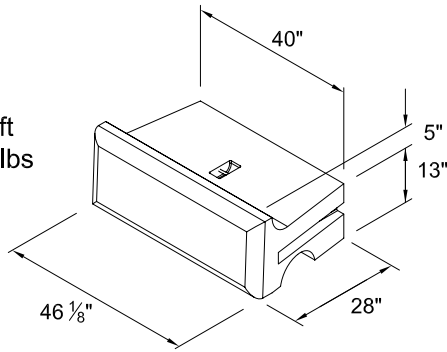
Footing bearing capacity is SATISFACTORY



41" SERIES BLOCKS

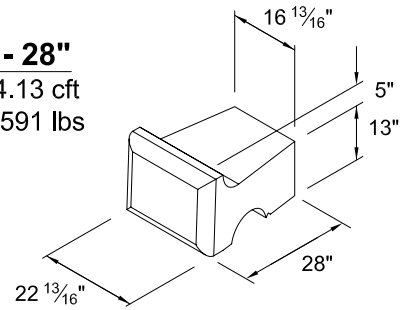
Top - 28"

Volume = 8.55 cft
Weight = ±1223 lbs
C of G = 15.06"



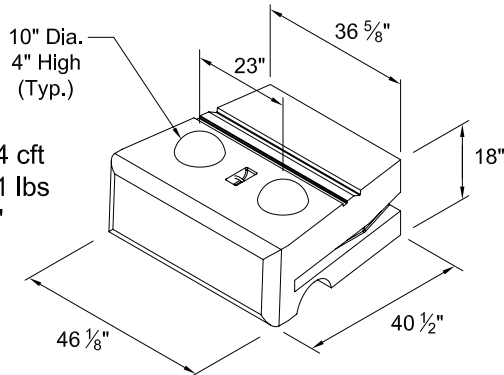
Half Top - 28"

Volume = 4.13 cft
Weight = ±591 lbs



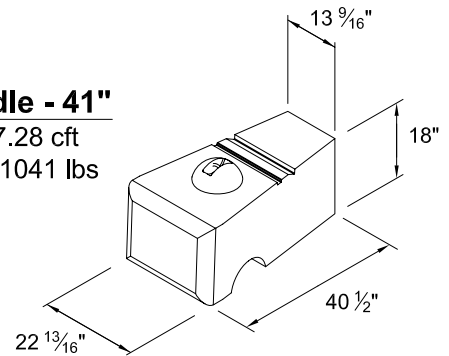
Middle - 41"

Volume = 16.44 cft
Weight = ±2351 lbs
C of G = 20.92"



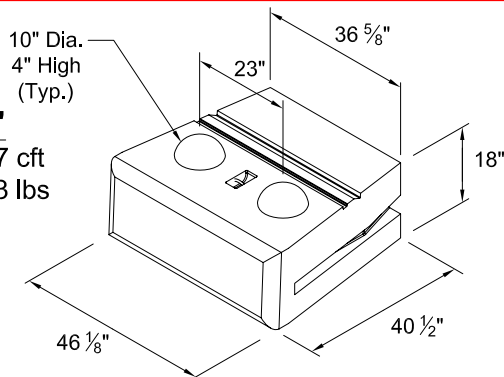
Half Middle - 41"

Volume = 7.28 cft
Weight = ±1041 lbs



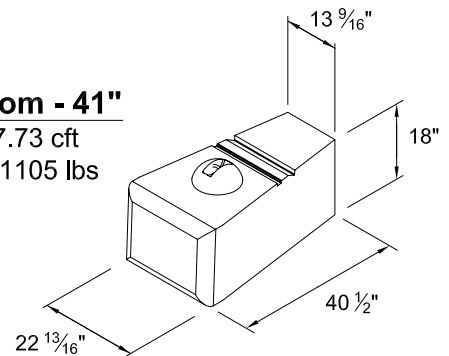
Bottom - 41"

Volume = 17.37 cft
Weight = ±2483 lbs
C of G = 21.3"



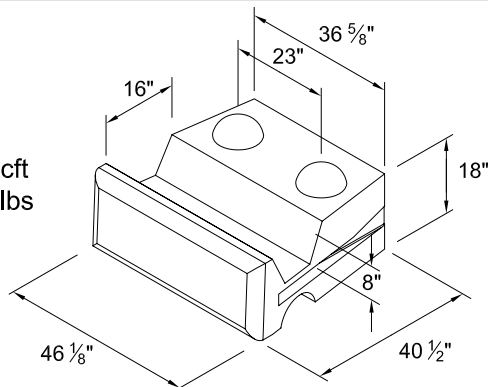
Half Bottom - 41"

Volume = 7.73 cft
Weight = ±1105 lbs



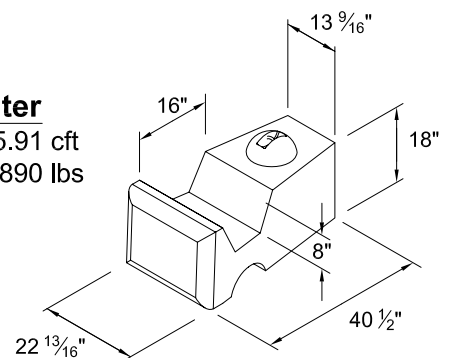
Planter

Volume = 14.12 cft
Weight = ±2020 lbs
C of G = 19.35"



Half Planter

Volume = 5.91 cft
Weight = ±890 lbs



NOTES:

Volume and Center of Gravity (C of G) calculations are based on the blocks as shown.

Center of Gravity is measured from the back of the block.

Half blocks may include a fork lift slot on one side.

Actual weights and volumes may vary.

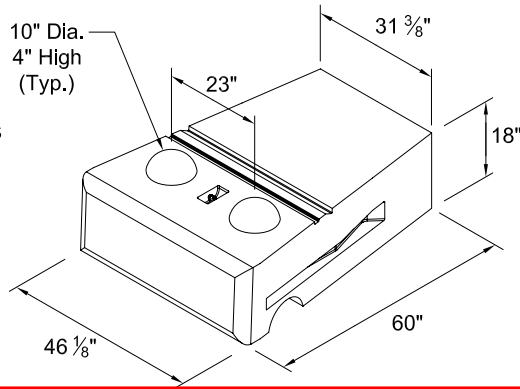
Weight shown is based on 143 pcf concrete.

DRAWN BY J. JOHNSON	01/09/09	Redi-Rock® International, LLC	
CHECKED BY			
APPROVED BY		DRAWING FILE 41in Series Blocks 010909.dwg	REVISION ---
ISSUE DATE		SCALE NO SCALE	SHEET NO. 1 OF 1

60" BLOCKS

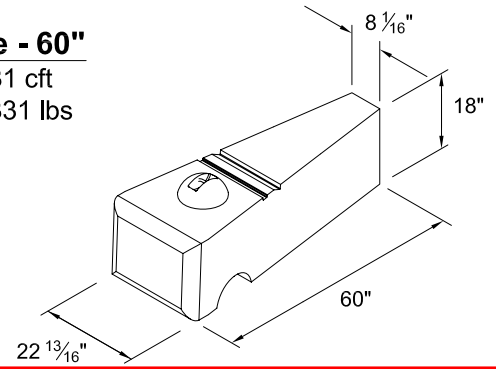
Middle - 60"

Volume = 23.0 cft
Weight = ± 3290 lbs
C of G = 31.28"



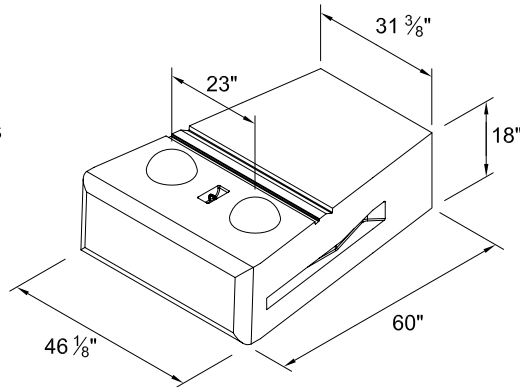
Half Middle - 60"

Volume = 9.31 cft
Weight = ± 1331 lbs



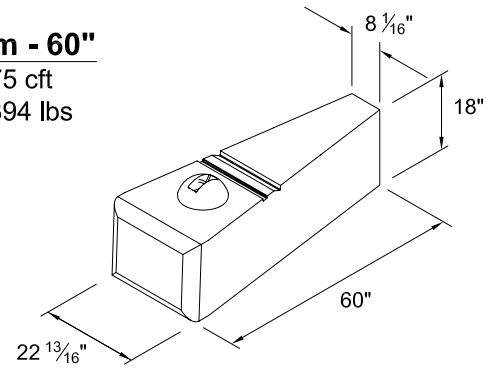
Bottom - 60"

Volume = 23.9 cft
Weight = ± 3420 lbs
C of G = 31.90"



Half Bottom - 60"

Volume = 9.75 cft
Weight = ± 1394 lbs



NOTES:

The 60" block is typically used as a bottom block in a larger wall. See the 41" Series for additional blocks and steps.

Volume and Center of Gravity (C of G) calculations are based on the blocks as shown.

Center of Gravity is measured from the back of the block.

Half blocks may include a fork lift slot on one side.

Actual weights and volumes may vary.

Weight shown is based on 143 pcf concrete.

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APPROVED BY		DRAWING FILE 60in Block Details 011209.dwg	REVISION ---
ISSUE DATE		SCALE NO SCALE	SHEET NO. 1 OF 1